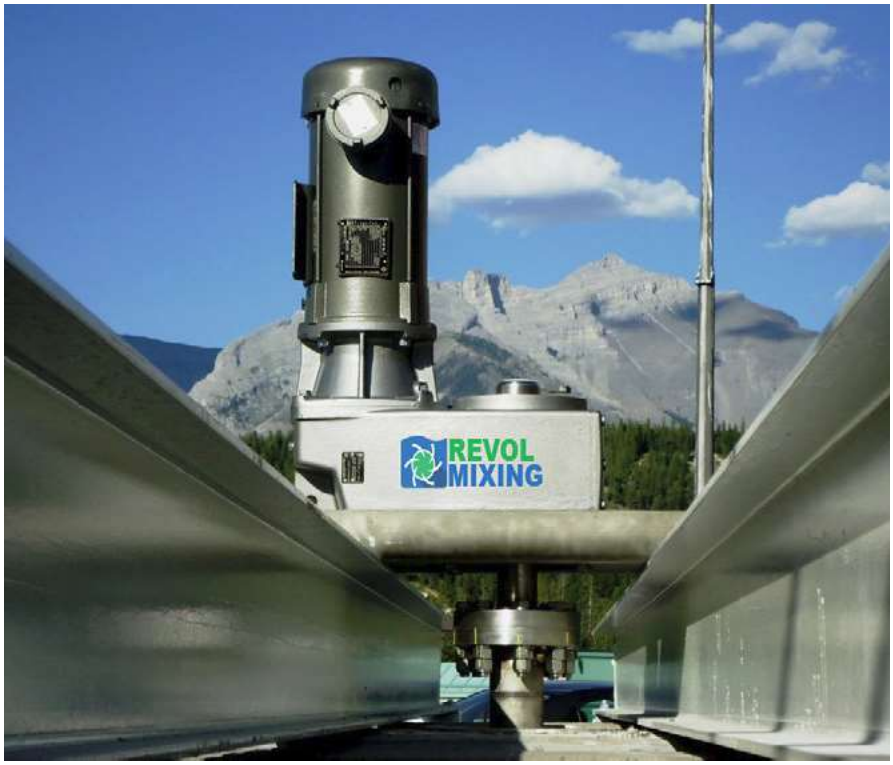


BANFF'S SLUDGE TANK MIXER IMPROVES PERFORMANCE, CUTS ENERGY, MAINTENANCE COSTS

By **Li Wang** and **Greg Jackson**

Many municipalities have operation and maintenance problems with solids settlement in their wastewater treatment facilities, such as septage receiving tanks, sludge (storage) tanks, fermenters and digesters. This is especially true in those that accept sludge from primary clarifiers, which normally contain a certain amount of sand and grit.

The sludge mixing tank at the Town of Banff, Alberta's wastewater treatment plant (WWTP) receives sludge from its primary clarifiers and dissolved air flotation. Its design function is to mix received sludge and send it to the fermenters, where volatile fatty acid is produced for bio-nutrient removal. One 5 kW submersible mixer was originally installed for sludge mixing. However, it had difficulty keeping solids suspended and a significant amount settled at the tank bottom. The solids settlement problem was so severe that the tank was taken out of service for more than four years.

Another problem with traditional mixers is the buildup of "ragging", which is comprised of such items as "flushable" wipes. This can cause submersible mixer impeller imbalance and seal failures. Leakage into the motor further damages the equipment. The plant had experienced frequent submersible mixer overhauls due to motor damage caused by seal failures.

In 2015, the Town decided to upgrade its WWTP and bring the tank back into service. To address the solids settling problem, different mixing technologies were evaluated.

Solids suspension requires sufficient upflow in the tank. Solids can only be lifted when upflow velocity reaches a certain value. Traditional submersible mixers pump liquid forward, forming a high velocity plume. The velocity anywhere else in the tank is relatively low. Other mixing technologies push liquid downwards, where it spreads radially across the tank bottom and then upward along the tank side walls.

If upflow velocity is not high enough, solids will settle at the bottom along the walls. This is not uncommon for facilities with traditional mixers installed. In most cases, to improve the mixing effect, much larger equipment was recommended. The motor power ranges from 3.7 kW – 17 kW.

Dennis Jasinsky, utility supervisor of the Town, found the high performance centrifugal dispersing impeller (HPCDI) technology, developed by Revolmix, to be an effective solution to this application. HPCDI applies a new concept for mixing and a different mechanism. Its unique design creates a flow pattern well suited for solids suspension.

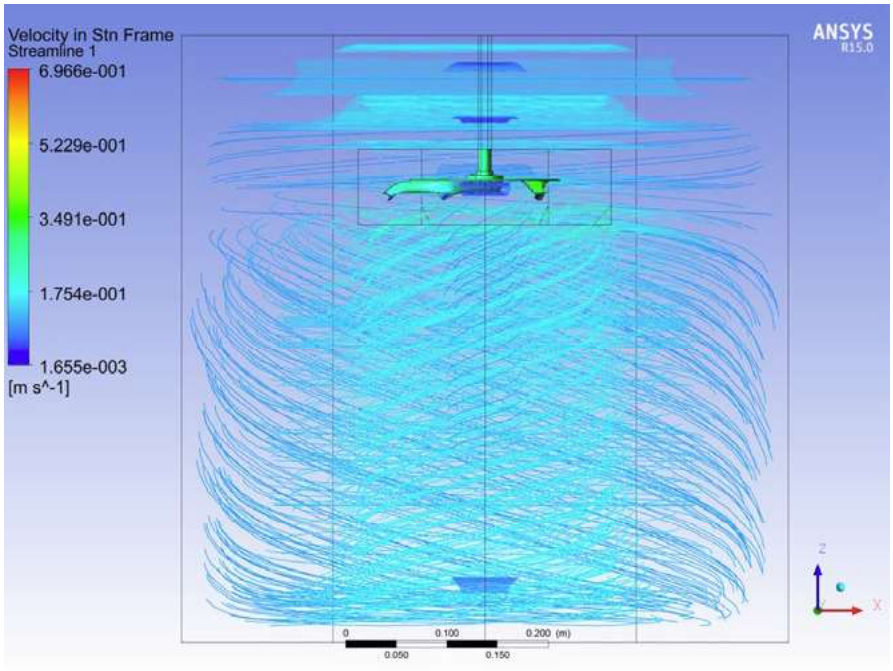
HPCDI lifts water toward the impeller with a tornado-like swirling movement. At the tank bottom, this swirling movement sweeps the solids to the centre where they are suspended. Such a flow pattern leaves a completely clean tank bottom, even at the edge of the side wall.

The vane configuration of the impeller allows HPCDI to pump more water at a relatively low velocity. It provides effective mixing by spreading solids outwards with centrifugal forces. Combined with the large impeller design, HPCDI creates movement of the whole water body in the tank at an even velocity. Without high local turbulence, this flow pattern provides significant energy saving.

RESULTS

The HPCDI was installed in 2015. It provides sufficient mixing to the tank, with solids suspension capability. No sludge buildup was observed after two years of operation. Measured power draw is about 1 kW. This is more than 80% less energy compared to conventional mixing technologies.

Energy saving is just part of the value



Top: *HPCDI lifts water toward the impeller with a tornado-like swirling movement. At the tank bottom, this swirling movement sweeps the solids to the centre where they are suspended.*

Left: *The vane configuration of the impeller allows HPCDI to pump more water at a relatively low velocity.*

provided to the plant. There is also a significant operation and maintenance saving for the mixer. Previously, plant staff had to pull out the submersible mixer annually for cleaning and maintenance. In addition, the plant had to rebuild the submersible mixers every few years. The HPCDI is a top entry mixer and the only maintenance is an annual oil change for the gear box, which takes one operator about 20 minutes. This interval can be extended to four years if synthetic oil is used.

The HPCDI was configured to create mixing under the impeller, with little disturbance to the water above it. There is no vortex at the water surface, which minimizes air/oxygen drawdown. This meant the sludge mixing tank could become a fermenter, producing volatile fatty acid for biological nutrient removal. It is estimated that about 40 kg – 100 kg is produced daily, which is another bonus from this upgrade project. ■

Li Wang, M.Eng., M.Sc, is with Revolmix Processing Ltd. www.revolmixing.com. Greg Jackson is with ACG-Envirocan. (Revol Mixing is represented by ACG-Envirocan. For more information, Email: greg@acgtechnology.com)